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ABSTRACT

Viewed through an investigation of the cultural and social impact of Information Technology (IT), this paper attempts to illustrate the theoretical and practical utility of HCI (Human Computer Interaction) to communication research. Informed by the full integration hypothesis, which suggests that information technologies have become part of the fabric of daily life, the paper illustrates the relevance of HCI to the design and development of safe, productive and usable artifacts. Using several relevant themes of HCI (individual differences, stakeholder analysis, sociotechnical design, and usability), the paper observes that HCI's interdisciplinary pragmatism offers considerable insight into the phenomenon of Information Technology. Furthermore, as a form of action research, HCI is not merely interested in the prediction and control of design outcomes, rather HCI actively shapes technological innovation. The paper suggests that both HCI and communication scholars could benefit from a mutual exchange of conceptual and methodological approaches. Contains 61 references. (Author/RS)

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Design for Living: The Theoretical and Practical Relevance of HCI to Communication Research

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Abstract

Viewed through an investigation of the cultural and social impact of Information Technology (I.T.), this paper attempts to illustrate the theoretical and practical utility of HCI (Human Computer Interaction) to Communication research. Informed by the full integration hypothesis (Vitalari, 1990), which suggests that information technologies have become part of the fabric of daily life, the relevance of HCI to the design and development of safe, productive and usable artifacts is illustrated.

Using several relevant themes of HCI: individual differences, stakeholder analysis, socio-technical design, and usability, it is observed that HCI's interdisciplinary pragmatism offers considerable insight into the phenomenon of Information Technology. Furthermore, as a form of action research HCI is not merely interested in the prediction and control of design outcomes, rather HCI actively *shapes* technological innovation. The authors suggest that both HCI and Communication scholars could benefit from a mutual exchange of conceptual and methodological approaches.

Keywords: Communication, Human Computer Interaction, design, research, theory

Design for Living: The Theoretical and Practical Relevance of HCI to Communication Research

Introduction

Advances in scientific knowledge and technological innovations in recent years have engendered a wealth of descriptive, speculative, and interpretive analyses of these developments (Rogers, 1983; Ronfeldt, 1992; Kroker and Weinstein, 1994). Few fields of study have been unaffected by the advent of the Information Revolution. Indeed, several disciplines, as distinct as library and information science (Ray, 1993; Watkins, 1994) and cultural anthropology (Escobar, 1994), have been reinvigorated in light of their demonstrable relevance to the study of Information Technology (I.T.) and its impact on users and organizations. As various schools of thought grapple with the psychological, social, political, cultural, economic, legal, pedagogical, and epistemological implications of I.T., the field of Human Computer Interaction (HCI), a relative newcomer to the academy, provides a dynamic, interdisciplinary approach for evaluating the complex and evolving nature of person-machine interaction. With its emphasis on the role of design processes and outcomes, HCI offers technicians, researchers, theoreticians, and policy-makers, a point of reference for evaluating the widespread effects of I.T. on daily existence, a design for living.

In an effort to illustrate the ways in which HCI contributes to understanding the implications of design methodologies, practices, and considerations on the development and applications of technological innovation, this paper attempts to map out the historic, and potentially revolutionary, impact of I.T. on social structures and behaviors. Drawing upon literature from communications, economics, cultural studies, critical theory, sociology and anthropology, the consequences of I.T. are explored. If, as is argued here, I.T. represents a potentially transformative agent akin to that of Gutenberg's printing press, the field of HCI offers important insights to understanding the effects of I.T. on individual and collective activities. In so saying, the authors urge greater active involvement of communications scholars in this emerging multidisciplinary field.

This call is not made lightly, nor is it necessarily original. Indeed, in the 1993 Journal of Communication special issue on The Future of the Field, Frank Biocca makes a compelling case

for HCI in communication studies (Biocca, 1993). "In some ways, the human factors approach to communication may signal a return to the creative interdisciplinary synergy that seemed to characterize the spirit of communication in its early years" (Biocca: 64). Ironically, the call for greater interdisciplinary approaches to communication research implicit in Biocca's discussion has, like so many similar calls, for the most part gone unheeded. The present discussion then embraces, and elaborates upon these calls for greater interdisciplinary scholarship within and between communication studies. Furthermore, this essay seeks to make *explicit* the theoretical and practical relevance of HCI to communication research.

Human-Computer Interaction (HCI) as a discipline

HCI (Human-Computer Interaction) is the study of the design, use and organizational impact of information technologies. It's major concerns are the development of more usable tools and the minimizing of undesirable impact on users. Though nowadays identifiable as an area of study, HCI is really an amalgamation of numerous disciplines interested in studying how humans interact with information technology. Booth (1989) argues that this is one of the strengths of this field and identifies 10 disciplines which inform the study of HCI: computational linguistics, artificial intelligence, cognitive science, sociology, ergonomics, organizational psychology, mathematics, cognitive psychology, social psychology, and software engineering. To this admittedly subjective list, Booth admits other disciplines may be added but fails to cite communications as one such addition. This discussion hopes to address this shortcoming. As a field of study then, HCI confronts a number of issues related to the design and development of I.T. and the social, physical and psychological impact of these systems on individual and organizational users.

Extending the analysis of design as science, and the artifacts we create as embodiments of theory (Dillon, 1994), we suggest that the design process is, in and of itself, a product of the prevailing modes of social, scientific, political, economic and cultural organization. As Berleur et al (1990) state:

> The roots of computerization are not merely technical but also symbolic. One must take into account several dimensions of society: the shared system of values, the dominant ideologies, the prevalent epistemological paradigm, the systems of management, the organizations structures, etc. This specific reading of history leads

> to a more precise understanding of the different fears which have emerged or the threats usually attributed to computer-based technologies about the centralization of power, individual freedom, political democracy, employment or culture (Berleur, J. et al., 1990, p. 23).

Taken from a cultural studies perspective, an investigation of I.T.'s impact on "lived experience", is well served by HCI's theoretical and methodological emphasis on the *implications* of design strategies and outcomes on individual and organizational activities. In order to interrogate the cultural impact of I.T. we utilize four relevant themes of HCI: individual differences, stakeholder analysis, socio-technical design, and usability (all of which incorporate, to varying degrees, most, if not all of, the aforementioned disciplines). This is not to suggest that other themes of HCI, such as work and task analysis, are not of use to the present study. Rather the authors believe these four themes offer a more parsimonious means to evaluate the social, political, economic, and cultural consequences of I.T., as outlined in this paper.

I.T. and the Full Integration Hypothesis

The adoption of, and subsequent organizational changes wrought by I.T. within the private sector are well documented (Keen, 1981; Markus, 1983; Kling, 1987; Crowston and Malone, 1988). Only recently have researchers begun in earnest to examine the nature and extent of I.T.'s influence on daily life outside of business and industry. This trend is evidenced in the evolution of HCI from its initial emphasis upon individual users toward a greater concern with the social, political and cultural consequences of I.T. Preece (1994) identifies several related factors which account for the broadening of HCI's scope: the increased utilization of I.T. in "life critical" systems such as air traffic control and health care systems; the increase in group work and other forms of CSCM (Computer Supported Cooperative Work); the integration of various media (text, sound, graphics, full-motion video) in a single workstation; and the need to keep abreast of technological change in order to maximize the human benefit of new technologies. Hence, HCI's importance and relevance increases as computers and information systems pervade everyday life.

In his attempt to determine the extent to which I.T. has an impact on daily life, Nicholas Vitalari concentrated his effort on an analysis of the household (Vitalari, 1990). Vitalari's rationale states:

> The household is a central social institution and a major arena in which many important aspects of daily life are carried out. The household in many cases is a forum for activities with other institutions. Work activities, educational activities, and social activities often influence household schedules and patterns of behavior. Domestic events and lifestyles impact the activities of other institutions (Vitalari, p.97).

Utilizing what he terms the full integration hypothesis, which stipulates that "information technology has, or will shortly become, an indispensable component of modern daily life", Vitalari examines the role of I.T. in everyday household activities (Vitalari, p. 97). The full integration hypothesis further suggests that as I.T. assumes a greater role in daily activities, these activities will be altered in significant ways, leading to changes in "basic social and economic structures," which in turn lead to macro level changes in social practices and organizing principles (Vitalari, p. 97). This has obvious parallels in the HCI literature where Eason (1988) for example, adopts a socio-technical perspective of technology and argues that all technologies result in shifts in the social organization surrounding them, often in unintentional ways. The importance of socio-technical approaches, particularly in terms of the political economy of information systems will be discussed in greater detail presently.

Using qualitative and quantitative methods, Vitalari identifies four dimensions of I.T.'s integration into daily life that can be used to test the full integration hypothesis:

1) the breadth of technological applications;
2) user utility;
3) computer literacy;
4) critical impact.

Each of these dimensions, to a greater or lesser extent, is reflected in the work of HCI researchers, not in a simple direct mapping, but in a broad though relevant manner. Inasmuch as this is valid, the present authors contend that communications theorists might benefit from exposure to this work, and conversely, HCI might benefit from the inputs of communication theorists.

The breadth of technological applications

The number and diverse nature of computing applications in modern social life continues to increase. Vitalari observes that individual household members utilizing a personal computer can now work, learn, bank, and shop from home, communicate outside of the home via the convergence of new and existing communications media, entertain themselves with video and computer games, and create music, visual and graphic art from a single home workstation. In this respect then, the first dimension of the full integration hypothesis, breadth of applications, is fulfilled. An examination of this finding yields two very relevant connections to HCI concerns.

Households are made up of individual users with varying needs, and skills. Here the HCI research on individual differences is most informative. In their review of the literature on individual differences, Dillon and Watson (in prep) seek to bridge the traditional divide within mainstream psychology between experimentalist and the differentialist approach to intelligence and ability testing. The necessity of bridging these two approaches in relation to interface design considerations is put this way, "[t]he ever-widening user population that is resulting from the diffusion of technology means it is no longer enough to base ergonomic inputs on generic models of the users or to assume training on computerized tasks can be standardized across user populations" (Dillon and Watson, in prep).

Egan (1988) lays out the following dimensions of individual differences relevant to HCI: experience, technical aptitudes, verbal and visual aptitudes, age, psychomotor skills, domain specific knowledge, personality and affect. Egan advances the importance and utility of studying and testing individual differences this way: "[w]e can test our understanding and put it to use by designing systems that enable a great variety of people to work productively with computers" (Egan, p. 544). All of this suggests a major tenet of HCI, that is that people should not have to adapt to technology, rather that technology must be designed to adapt to people. The need for adaptive interfaces which allow the user to customize his/her machine interface increases as technology diffuses within and across populations. Here, the relevance of design across a continuum of users, from individuals

to collectives, is evident and must inform the development, deployment and evaluation of information systems.

A second connection is in the area of organizational or social impact of technology. The fortuitous nature of technological applications and the unintended consequences of technologies and innovations provides an intriguing venue for undermining the arguments of technological determinists, as well as an illuminating vehicle for examining the cultural dynamics of technological development and diffusion. The impact of failed applications and unintended consequences of technologies on everyday life provides some insight into the complex and evolving nature of design and development. For example, Edison's phonograph, his "talking machine", was developed primarily for business applications and not for leisure purposes. Writing for the *North American Review*, Edison predicted the phonograph to be:

> the perfect dictation machine and record-keeper. It could also be used to record phonographic books for blind people; teach elocution; record the 'last words' of aged family members; preserve dying languages; teach rote lessons to schoolchildren; transmit and preserve 'permanent and invaluable' business records; and when perfected, 'be liberally devoted to music' and used in music boxes, toys' and talking dolls (Edison, quoted in Nasaw: 1993, 120)

Edison's talking machine proved impractical for the late nineteenth century business community. For members of the growing leisure industry however, the phonograph as a singing machine was, in many respects, revolutionary, spawning the recording industry, and later providing the basis for radio broadcasting.

Radio too provides an example of a failed application of a technological innovation and the unintended consequences of successful technologies. As envisioned by Marconi, radio was conceived as an improvement on an existing technology. A "wireless telegraph", radio was developed as a point to point communications medium. More by chance and human agency than by design, radio developed as the mass medium we know today.

In the I.T. arena, the ARPANET, predecessor of today's Internet, was conceived and developed as a tool for the military-industrial complex as a command and control network. Members of the military and scientific communities utilized ARPANET to relay information in a

secure fashion via interconnection of large mainframe computers. As such, it can be viewed as a successful technology which has continually developed in a dynamic, and largely unpredictable fashion, with implications far beyond the narrow scope of its original design.

User utility

The second dimension of the full integration hypothesis, user utility, presents something of a paradox, but serves to illuminate the complexity of the concept of usability, a core concept in HCI research. For Vitalari, utility is the bottom line of a system's usability. In his estimation, I.T. does not meet this dimension of the full integration hypothesis. Observing that the majority of personal computer applications such as spreadsheets, word processing, databases, and desktop publishing are extensions of work-related activities, Vitalari finds the overall user utility quite low.

> For example, home banking and home investment activities have not captured a significant base of users. ... Yet, many potential users cannot fathom the tangible value and utility of computer-mediated banking, investing, shopping, or reading the newspaper when compared to the convenience and familiarity of current media. Moreover, some applications areas, such as shopping have a social component that is lost in the computer mode (Vitalari, 104).

Within the HCI literature, the concept of utility is related to usability in most discussions of interaction. Shackel (1991) defines the acceptability of a technology in terms of an equation involving utility and usability, divided by cost. Much work in the Information Systems literature also links ease of use with perceived usefulness in deriving predictors of likely acceptance (see e.g., Davis, 1989).

While the study of utility, *per se*, is rarely tackled explicitly on its own in the HCI literature this is a function of the terms used rather than lack of interest. So much of HCI research is concerned with work and task analysis and the attempted derivation of usable technologies to support task performance. Indeed, the general definition of usability proposed by Shackel (1991) and subsequently adopted for study with minor modification by the International Standards Organizations, equates usability with the effectiveness, efficiency and satisfaction with which users can complete tasks. This definition in essence establishes a dependency relationship between utility

and usability which means that lack of utility in any technology cannot be compensated for by usability.

Computer literacy and critical impact

The third dimension of the full integration hypothesis, computer literacy, is restricted, in Vitalari's estimation, to a specific demographic group. "The data suggest that if daily life is being affected by information technology it is primarily in the highly educated and affluent households within developing societies" (Vitalari, p.105). Here the issue of literacy is inextricably bound to the final dimension of the full integration hypothesis, that is, the critical impact of I.T. on daily life. If, as Vitalari suggests, computer literacy is tied to issues of computer access, and ultimately to socio-economic structures, I.T. may widen what communication researchers refer to as the information gap (Siefert, Gerbner and Fisher, 1989; Hills, 1991).

The disparity between information haves and have nots, is not lost on HCI scholarship. In a thoughtful and well-articulated discussion, Shneiderman (1987) identifies the "information poor minority" as one of the "ten plagues of the Information Age" (Shneiderman, p.540-544). Observing how a utopian vision of I.T. sees the distinctions between rich and poor eradicated via new technologies, Shneiderman, like other responsible scholar/practitioners, is wary of such "visions" and offers a challenge to the design community. "Those people without computer skills may have a new reason for not succeeding in school or not getting a job. Already great disparity exists in the distribution of educational computers. ...Can we build systems that empower low-skilled workers to perform at the level of experts?" (Shneiderman, p. 541).

Complicating the issue of computer literacy, for most, if not all, interface designs, is the prerequisite of "traditional" literacy (Gerver, 1986). Generally speaking, an individual must know how to read and write prior to operating most systems. However, Gerver's discussion of the role of computers in adult basic education finds promise in the increased use of computerized learning for adult literacy, numeracy, computer literacy, health care, and the dissemination social and cultural knowledge. "Computer-aided learning, with its emphasis on the acquisition of skills and information, has appeared to many community educators to offer a great deal of potential for

developing skills in all of these areas, although such programs are always used as only one element in a variety of learning experiences" (Gerver, p. 67).

Here the concept of computer literacy is tied, this time, to issues of learnability and usability. The use of adaptive interfaces in system design is becoming increasingly important as designers attempt to create systems which target large, heterogeneous user populations (Egan, 1988). For example, Smith and Tiefel (1992) describe the use of embedded training in The Gateway computerized library system and the efficacy of the interface design principles used in the development and subsequent evaluation of the system. Christensen (1993) describes the Drexel Hypermedia Demo, a hypermedia system designed to teach adult learners about Hypermedia. Christensen describes several dimensions of the demo, including: navigation in hyperspace, learner control, and design principles, including user feedback.

Using computers to learn about computers suggests that the very nature of literacy may be radically altered due to the impact of I.T. on information storage, retrieval, production, and dissemination (Compaine, 1984; Levine, 1990). Compaine sees I.T. as the catalyst of a "New Literacy", characterized not by the ability to program computers, rather by the "bundle of information skills" necessary to function in the Information Society (Compaine, p. 1) . Noting that I.T., far from making print obsolete, has dramatically increased the amount of printed materials produced and disseminated, Levine finds this new literacy problematic. Levine's conclusion brings us full circle on the issue of computer literacy when he observes that those with little or basic literacy skills are becoming increasingly disadvantaged (in terms of employment requirements and educational opportunities) in the information age.

One final note on the impact of I.T. on culture. Computers are not just found on the desktop, or the laptop, for that matter. "Microprocessors are an essential built-in part of a variety of apparatus for domestic and individual use," observes Felix van Rijn (1990). In this respect, van Rijn's evaluation of user utility is at odds with Vitalari's. The ubiquity of the microprocessor in audio-visual units such as stereos, TVs and VCRs, clothes and dish washing machines, microwave ovens, digital watches, and automobiles, has, according to van Rijn, a cultural impact.

"If the microprocessor is an essential part of a machine, then the social and cultural impact of this machine should be taken as an indirect effect of information technology" (van Rijn, 1990, p. 91-92). The introduction of the microwave oven, for example, reorganizes food preparation and consumption practices. Video tape rentals and time shifting, made possible by the VCR alter TV viewing habits, as does the remote control device (RCD). Answering machines and email permit the time shifting of message reception ("Did you get my message/email?"). Operating systems fragment computer users into product loyalty camps, or faiths as Umberto Eco might have it.

Exposing Tensions: Socio-Technical Systems Approaches

The link between technology and social structures is a major theme of communication studies and an area within which further connections between this field and HCI can be drawn. Due to their ability to shape, and challenge existing power relations, new communications media are the site of political contest. Social historians, political theorists and communication scholars, have explored the role of communications media in altering, extending and enhancing power relations (Habermas, 1974; Marvin, 1988; Carey, 1989; Anderson, 1991). For example, the role of the printing press in organized religion's failed attempt to consolidate political and economic influence across Europe, and the subsequent rise of the nation-state, is illustrative of the role of communications media in the articulation of power relations (Anderson, 1991; Lippman Abu Lughod, 1992).

Today, the influence of I.T. upon the new global economic order is evidenced in the radical restructuring of manufacturing systems, labor and management organization, capital accumulation and distribution, national development strategies, and international relations.

> Companies organize around specific consumer markets without regard to national borders and locate their production or service facilities where they make the most economic sense rather than adhering to national development policies. As a result, the MNCs are accelerating the development of a world economy in which the prime competitive strength or weakness of countries is the quality of their workforce or human capital (Jassawalla, p. 38)

In large measure, the developments of advanced telecommunication and transportation systems were the logical, and somewhat inevitable response to the recent crisis of capitalism (Harvey,

1991). Furthermore, just as print-capitalism gave rise to the social/political articulation of the nation-state, I.T. challenges the sovereignty of the nation-state and fosters the re-articulation of social/political organizing principles around regional, and ultimately global economic integration (Ohmae, 1990). The current state of flux (if not crisis) of economic, social and political power relationships within and between nation-states is due in part to the development of Information Technologies.

All this has links with the HCI literature that are worth exploring. Dominant social structures and practices inform the design, evaluation, and implementation of technological innovations. Economic imperatives, socio-cultural biases, and power relations influence the development, diffusion, and application of new technologies. As Sue Curry Jansen observes, "[T]echnological designs are also social designs. Cultural values, economic interests, and political decisions are as integral to their composition as mathematical calculations, motors, cams, circuits, and silicon chips" (Jansen, 1989, p. 196). Rather than give ourselves up to the rigid causality of technological determinism, our understanding of the socially constructed nature of technology suggests a rejection of the reactive mode of a great deal of communication research and demands we take up an *interventionist* approach to technological design and development.

The importance of HCI in acknowledging and attempting to "work through" these influences is reflected in the increased interest in recent years on the organizational impact of computer systems and the emergence of participatory design strategies which seek to involve workers in the design of the tools they will use (Ehn, 1988). "The success of a system, however, does not just depend upon the system matching user needs and supporting users in their tasks, but also upon the match between the system and the social and political factors within the host organization" (Booth, p. 177). This emphasis on the contextual issues surrounding the consequences of the design and implementation of computer systems on individual users within and between organizations is central to socio-technical analysis. In his explication of the socio-technical approach to systems design and organizational impact, Eason notes,

> The challenge of information technology is that it is a flexible technology which will transform society. Because it is flexible we

> have the opportunity to transform society in ways that reflect human values that are shared by the majority of the population. The danger is that this will not occur because each design process will continue to be dominated by technical considerations. Society may then be shaped not by the malice of powerful, self-seeking decision-makers but by the accidental effects of decisions taken for technical reasons (Eason, 1988, p. 10).

At the heart of Eason's observation is the need for a more proactive, participatory, and anticipatory research agenda. In other words, in order to create safe, productive, and useful systems which maximize human benefit and potential, an *action research* approach to the design, development and evaluation of information systems is imperative. Such an approach, it is suggested here, is equally important to effective and practical communication research. A brief discussion of socio-technical systems theory followed by a few examples of user-centered design strategies will bear out these claims.

Socio-technical theory is concerned with the interaction between the social and technical sub-systems that make up information systems. In so doing, socio-technical theory views information systems as dynamic, evolving and interacting entities. In this view, technical and social systems are not isolated entities, rather they constitute an open system in which technical, social, organizational, environmental and contextual factors are interdependent. This approach highlights the need to match these two systems in appropriate ways. All too often a great deal of time and effort is spent on a very rational and structured design strategy for the technical elements of a system with little, (generally ad hoc) attention paid to the human systems working in tandem with the technical system. Socio-technical approaches seek to integrate these two sub-systems in order to achieve a "joint optimization of the interdependent social and technical sub-systems" (Eason, 1988 p. 45).

Socio-technical theory attempts to reorient design processes away from its "natural" emphasis upon the technical requirements of a given system and to emphasize the social and organizational requirements of all relevant stakeholders of a particular information system. This strategy fosters greater systems integration while promoting greater commitment on the part of systems users to work toward successful systems integration. While participatory design engenders a shared sense

of ownership or belonging, Eason is quick to point out "it is not sufficient, however, for commitment to come from a few leading players on the user side. It has to be a commitment across the user community or the initiative may fail because significant user groups perceive themselves as losers and do not cooperate" (Eason, 1992 p. 2). Hence, socio-technical theory has an implicit understanding of the dynamics of power relationships in the design and development of information systems.

These considerations lead to an increased awareness of and appreciation for participatory design. In this formulation, users articulate systems requirements, evaluate prototypes, select and ultimately commit to systems design. For their part, designers identify systems options, provide and or enhance system functionality, and eventually build and maintain a given system. Indeed, such an emphasis highlighted not only the need for iterative design strategies, but provided insight into nature of the design process itself. With the rapid diffusion of I.T. to broader and ever more heterogeneous user populations, socio-technical approaches take on increasing importance and face tremendous challenges.

For some, computers are an absolute necessity for functioning in the Information Society. As a result the design community is continually challenged to develop systems that "everyone" can access and use. Wood (1993) reports on the results of three case studies that found designs which met the needs of older people perform well for a wide range of users, not just the elderly. Wood observes how this type of research is essential in light of the increase of human-computer interaction for diverse populations in a public settings.

Innovation in interface designs which might facilitate the accessibility and ease of use for such diverse populations continues to be the subject of deliberation for design specialists. Participants at the Fifth International Conference on HCI (Friedman, 1993) considered the next generation in user interfaces. Speculation on likely interface improvements included 3-D gesture and voice recognition, eye tracking and intelligent agents. Machines which adapt to individual differences are expected to increase in sophistication and technical prowess. Several innovations offered included the modification of font size according to user-interface distance and the

development of plug-in applications. Adaptive interfaces will feature computers with self-programming features (Friedman). However, it is worth noting that many predictions made for future technologies, particularly when those predictions involve some aspect where the human is involved, have proved wildly inaccurate over the years (see e.g., Jonassen's 1982 prediction of the demise of the paper book within a decade).

Provided that user-centered designs are developed in no way assures that these systems are accessible to a diverse user population. A central paradox in the design and deployment of "empowering" systems is the inability of those segments of the population most in need of these systems to access them (Murdock and Golding, 1989; Dunn and Leeson, 1993). The increasing privatization of mass communications media and the attendant convergence of traditional and new media deny certain segments of the population access to these systems. Rather then empowering economically disadvantaged groups, socio-economic hierarchies are buttressed by the dynamics of technological innovation and capital accumulation. An increased awareness of the political economy of I.T. on the part of both the HCI and communication research community is essential. Socio-technical approaches provide a framework to examine and alleviate the inequities of information systems design and development

An Enviable Pragmatism: HCI's Methodological Toolbox

How are we to make sense of all these developments and their implications at the individual, organizational and social levels? What methods and theories can communication scholars employ that will render the I.T. problematic tractable? The present authors contend that, in part, the field can gain much from studying the work in the related field of HCI.

The study of Human-Computer Interaction is essential to the successful design, implementation, and maintenance of Information Technologies. In an increasingly complex, interconnected, information-dependent society, HCI's relevance would appear undeniable. Equally irrefutable is the importance of communication research in understanding the ways in which the convergence of traditional and new communication media inform, shape and effect individual and societal behavior and perceptions. The utility of HCI to communication research

has been noted, but has yet to be recognized. This paper has attempted to link some of the practical and conceptual themes of HCI study to communication research.

There is little doubt that communication studies have an implicit understanding of the role of design in the development and diffusion of technological innovations. Likewise, questions of capital formation, social and political power relations, the production of culture and the influence of these structural and organizational principles in the development and application of technologies are central to communication research. The shared concerns of communication research and HCI are then, quite clear. This discussion emphasizes the need to encourage and cultivate a reciprocal relationship in which HCI and communication share information, resources and methodologies in the development and of *acceptable* information technologies.

> The structural crisis of the 1990s is in this perspective a prolonged period of social adaptation to the I.T. paradigm. Changes in the techno-economic paradigm are based in combinations of radical product, process and organizational innovations. They necessitate changes in the institutional and social framework, as well as in most enterprises if their full potential is to be exploited. Where technological change is rapid, there is usually a great deal of inertia in social institutions buttressed by the political power of established interest groups, as well as by slow response times of many individuals and groups (Jassawalla, p. 43).

The urgency for a deeper understanding of the ways in which humans interact with I.T. on both the micro and macro level increases with each and every technological innovation and calls for a pragmatic, interdisciplinary, and interventionist strategy.

HCI is a multidisciplinary field of study which draws upon a number of intellectual traditions. Being an academic "new kid on the block," HCI has grappled with institutional biases and the of difficulties of status that many new fields of study must endure. Viewed in this way, HCI may be seen as having a parallel development with a slightly more "mature" field of study: communications. Like HCI, communications is, at its core, a multidisciplinary field, "informed" by a various schools of thought: psychology, sociology, political economy, anthropology, and linguistics, to name a few. So too, communications research has had to, and to some extent, continues to "legitimate" itself within the academy. There are, however, more profound linkages between the two fields.

The social scientific approach to communications research focuses primarily upon the micro level effects of media. HCI's concern with the impact of design upon the user, in particular, the concern of HCI researchers on individual differences, echoes the concerns of the social scientist with media effects. Critical/Cultural scholars are interested in macro level consequences of media technologies. This concern is similar to HCI's analysis of social and organizational impacts. More significantly, HCI uses the same methods of analysis of both the social scientist and the critical/cultural scholar without the methodological wrangling communication researchers so often exhibit. In this respect HCI is closer to the methodological eclecticism of communication law and policy studies. However, where legal communication scholarship enjoys an interdisciplinary flexibility it is largely a reactive endeavor. HCI's advantage comes in its *proactive* and anticipatory approach to new technologies and the explicit concern for the consequences of technological design. In order to answer questions of individual differences, usability and utility testing, and stakeholder analysis, HCI researchers utilize both quantitative and qualitative methods. Depending upon the nature of the inquiry, HCI scholars use what ever method works in order to "get at" a particular issue. HCI makes use of what might be referred to as a "methodological toolbox" to answer the questions it posses (Dillon, personal communication). In this respect, HCI exhibits an enviable pragmatism sadly lacking from communications research. What follows is a brief sketch of the links to be made between HCI and communication research.

Consider for example the Uses and Gratifications tradition in communication research (McLeod and Becker, 1981; Rosengren, Wenner and Palmgreen, 1985). Social scientists make use of a number of tools such as attitudinal and cognitive measures in order to tap into media audiences motivations for using, and satisfaction with, media stimuli and communication technology. These findings are then generalizable to the population at large. In the HCI tradition, usability testing approaches the user, as does the uses and gratifications researcher the audience member, as an active user capable of articulating his or her design preferences. With the increased proliferation of interactive media, and the promise of adaptive interfaces, the uses and gratifications tradition is faced with some significant and rather exciting challenges. Here the HCI literature on

user satisfaction may provide a framework to examine, for example, how the conflated role of media producer/consumer alters the dynamics of user satisfaction and gratification.

Similarly, issues of learnablity and usability are akin to the Processes and Effects tradition of social scientific communications research (Schramm, 1954). Both the communication scholar, and the HCI researcher are interested in learning styles, information processing, and knowledge retention utilizing cognitive, affective and physiological measures. The integration of text, audio, graphics and video complicate matters for researchers interested in processes and effects. Perennial media content questions such as media violence, pornography, agenda-setting and gatekeeping take on increasing importance in an "information rich" environment. What's more, new effects questions tied to issues of cultivation and social learning theory emerge in the new media context.

The macro level concerns of HCI researchers are quite similar to the issues confronted by the critical/cultural scholar. The issues of access to, and uses of, communication technologies are central to the broader issues of knowledge production and dissemination so often studied by the critical/cultural scholar. The socio-technical tradition of HCI research has similar concerns when addressing the social and organizational impact of computer design. Likewise, HCI's use of stakeholder analysis, on both the micro and macro levels, has important implications for critical scholars interested in social and political power structures. Indeed, stakeholder analysis can have a significant role to play in policy questions regarding new and existing media organizations.

HCI researchers are interested in the organizational impact of information systems on work cultures, similarly, communication researchers working in the cultural studies tradition are interested in the local production of culture. How users appropriate I.T. in cultural production within and through an increasingly global telecommunication infrastructure becomes a exciting site of inquiry. Furthermore, questions of individual and collective identity formation central to cultural scholars become increasingly problematic, and that much more intriguing in light of the ephemeral and transitory nature of online interaction. The ability to "customize social interaction" (Jones, 1995) is directly related to the nature of the interface and the usability of the artifact.

HCI researchers often view the interaction between humans and computers as a dialogue. Booth defines dialogue as "the exchange of symbols between two or more parties, as well as being the meanings that the participants in the communicative process assign to these symbols" (Booth: 46). This exchange between human and machine, as well as the exchange between humans **via** machines becomes increasingly problematic as we enter the "converged information future" (Vaughan and Hinshaw, 1995). The interactive future of communication technologies provides a dynamic environment for the study of human-computer interaction and the consequences of this interaction for the individual and the society at large.

Practical Communication Research

Revolutionary changes in the ways in which people communicate produce equally dramatic changes in social, political and economic relations. Questions of how new media are developed, utilized, understood, and influence social organization are just as critical as questions of media ownership and control, access to these media, and the impact these media have on groups and individuals. HCI offers many of methodological and conceptual tools necessary to explore the dynamics of human-machine interaction, and ultimately, how these interactions influence culture and society. Furthermore, as a form of action research, HCI is not merely interested in the prediction and control of design outcomes, rather, HCI actively *shapes* technological innovation. Working in conjunction with HCI researchers, communication scholarship may yet become what Robert Craig has called a practical discipline. "As a practical discipline, our essential purpose is to cultivate communicative praxis, or practical art, through critical study. All of our work does, or should, pursue that purpose" (Craig, 1993 p. 98).

In his explication of this concept, Craig offers several exemplars by which communication can model itself as a practical discipline. The ancient art of rhetoric, Craig suggests is such an exemplar. Craig identifies three characteristics of rhetoric useful to communication scholars: "(1) a dialectical interplay between theory and practice; (2) a detailed technical account of the practice; and (3) a series of coherent, universalized reconstructions of the practice that collectively highlight its intrinsic principles and values as well as the problems and paradoxes that it

inescapably faces" (Craig p. 99). The same can be said of HCI. First, HCI explores the tensions between the theory and practice of design strategies and outcomes in ways which illuminate and challenge both theoretical foundations of "good design" and the practical constraints of design and development. Second, HCI strives to make design considerations known to engineers and computer scientists on one hand, and to end-users on the other. Third, HCI consistently observes the need to make trade-offs throughout the design process and information system development, implementation, and maintenance. Like rhetorical studies then, HCI seeks to evaluate, facilitate and improve communicative practice.

One final observation on the relevance of HCI to communication research. As Craig notes, a "[P]ractical discipline thus finds its home in a community of methodologies united by their common devotion to a critical study of practices that does not presuppose a 'progressive' socio-historical analysis. This community is not a quiet refuge but a lively, growing place whose denizens have much to build and much to gain from their mutual intercourse" (Craig p. 111). A good deal of the ferment in the field of communication comes from its inability to reconcile the epistemological differences between its foundational disciplines. Rather than shun its interdisciplinary tendencies and retreat into paradigmatic isolationism, communication scholarship ought to celebrate and *leverage* its disciplinary diversity much as HCI does. Communication research is better served by exploiting its connection to "outside" disciplines. HCI is a good place to start.

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